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Lemelson

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(54) **HAND-HELD VIDEO CAMERA-RECORDER-PRINTER AND METHODS FOR OPERATING SAME**

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(63) Continuation of application No. 08/110,861, filed on Aug. 24, 1993, now Pat. No. 5,446,599, which is a division of application No. 07/818,168, filed on Jan. 8, 1992, now Pat. No. 5,260,837, which is a division of application No. 07/325,768, filed on Mar. 20, 1989, now abandoned, which is a continuation-in-part of application No. 06/877,319, filed on Jun. 23, 1986, now Pat. No. 4,819,101, which is a continuation of application No. 06/516,532, filed on Jul. 25, 1983, now Pat. No. 4,604,668, which is a continuation of application No. 06/209,057, filed on Nov. 21, 1980, now abandoned.

(51) **Int. Cl.**[7] **H04N 5/225**; H04N 5/76

(52) **U.S. Cl.** **386/117**; 348/207; 358/906; 358/909.1

(58) **Field of Search** 360/35.1, 33.1, 360/31, 10.3; 358/335, 342, 906, 909.1; 386/1, 38, 46, 117–121; 348/207; H04N 5/225, 5/76, 9/79, 5/92

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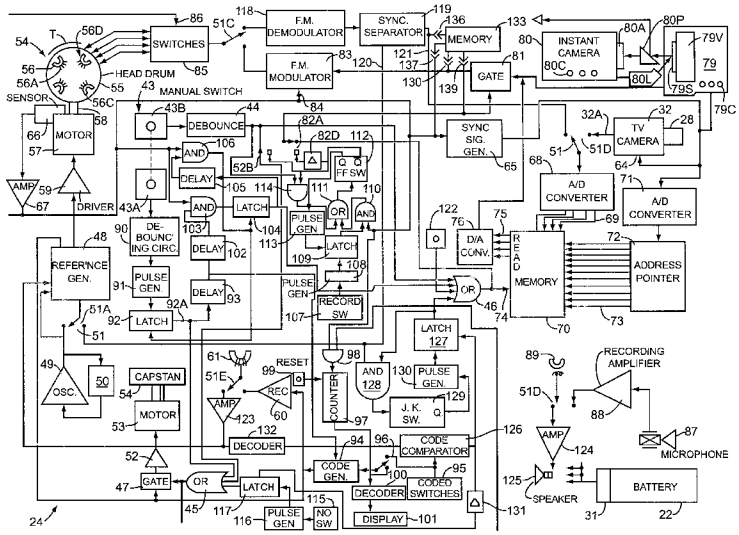
(57) **ABSTRACT**

A portable camera and recording device capable of recording motion picture and still image signals on an erasable magnetic tape and, in an embodiment thereof, still images on hard copy as photographic images. A single assembly supports a television camera at one end, a videocassette recorder behind the television camera and an instant photographic camera below or to the side of the television camera. Still and motion picture images of image phenomena recorded as full-frame video picture signals on the magnetic tape and are displayable on a miniature electronic display screen within the housing. Controls on the housing permit select still images of frames of recorded picture information to be selectively displayed on the screen, viewed though an eyepiece and passed through an aperture of an instant photographic camera for photoghic reproduction. Methods for effectively operating the camera and producing magnetic recordings and hard copy recordings are also provided.

17 Claims, 2 Drawing Sheets



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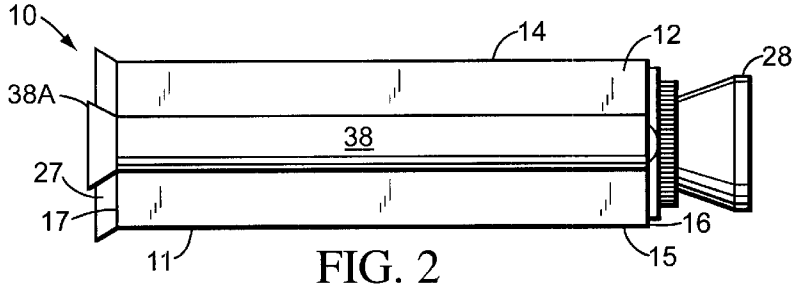

FIG. 2

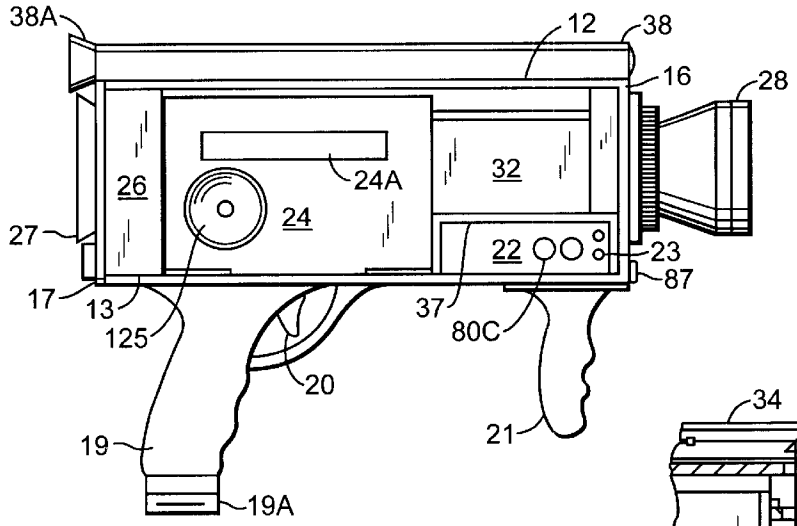

FIG. 1

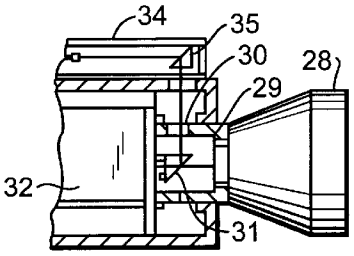

FIG. 3

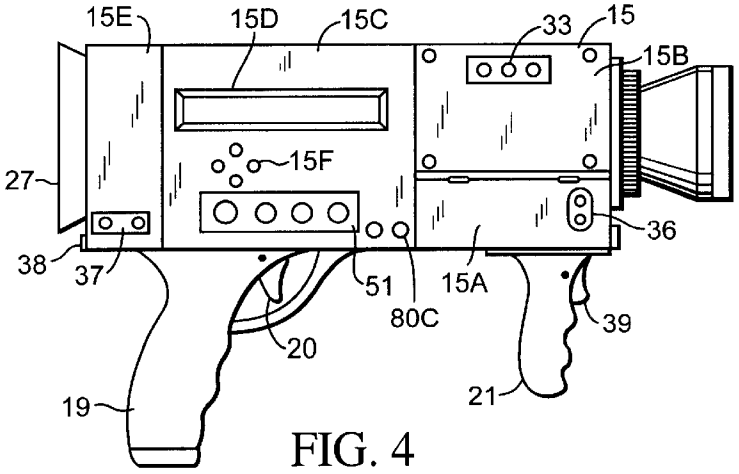

FIG. 4

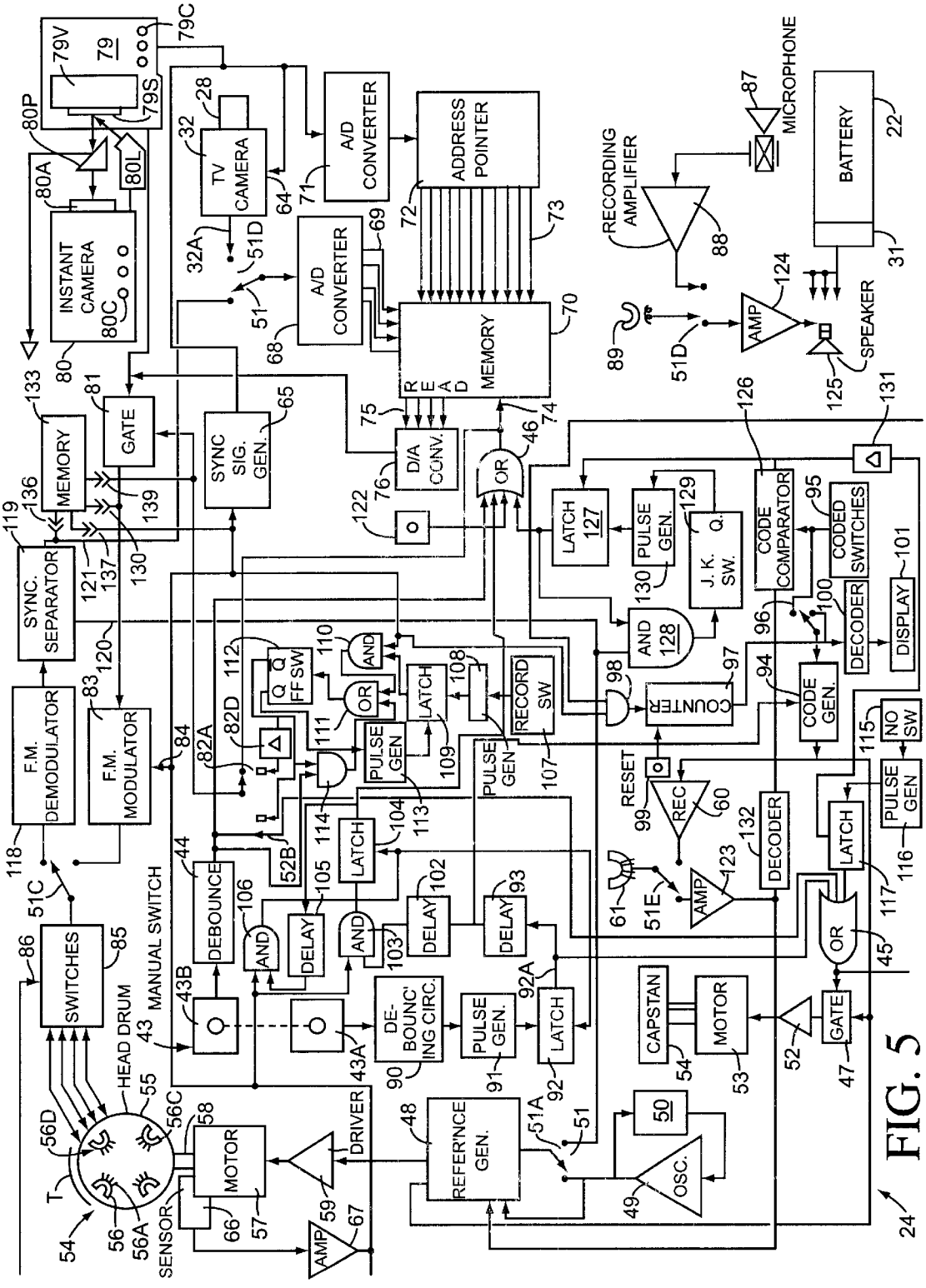
INSTANT CAMERA
TV CAMERA
A/D CONVERTER
ADDRESS POINTER
MEMORY
RECORDING AMPLIFIER
MICROPHONE
BATTERY
SPEAKER
AMP
SYNC. SEPARATOR
F.M. DEMODULATOR
F.M. MODULATOR
SYNC SIG. GEN.
GATE
D/A CONV.
LATCH
PULSE GEN.
J. K. SW.
CODE COMPARATOR
CODED SWITCHES
DECODER
DISPLAY
AND
OR
COUNTER
CODE GEN.
NO SW
RESET
REC
RECORD SW
Q Q FF SW
DEBOUNCE
DELAY
MANUAL SWITCH
SWITCHES
HEAD DRUM
MOTOR
DRIVER
SENSOR
DE-BOUNC' ING CIRC.
REFER'NCE GEN.
OSC.
CAPSTAN
GATE

FIG. 5

HAND-HELD VIDEO CAMERA-RECORDER-PRINTER AND METHODS FOR OPERATING SAME

RELATED APPLICATIONS

This application is a continuation of application Ser. No. 08/110,861, filed Aug. 24, 1993, now U.S. Pat. No. 5,446,599 which is a division of application Ser. No. 07/818,168, filed Jan. 8, 1992, now U.S. Pat. No. 5,260,837, which is a division of application Ser. No. 07/325,768, filed Mar. 20, 1989, abandoned, which is a continuation-in-part of application Ser. No. 06/877,319, filed Jun. 23, 1986, now U.S. Pat. No. 4,819,101, which is a continuation of application Ser. No. 06/516,532, filed Jul. 25, 1983, now U.S. Pat. No. 4,604,668, which is a continuation of application Ser. No. 06/209,057, filed Nov. 21, 1980, abandoned.

FIELD OF THE INVENTION

The invention is in the field of television signal recording and hard copy reproduction devices which are portable.

THE PRIOR ART

The prior art consists of portable television camera-recorder systems involving a number of separate units which are cumbersom or lack versatility. Viewing of recording pictures and editing is accomplished off line or wherein the methods for effecting same are not efficiently effected. Hard copy of still pictures requires large and expensive equipment separate from the camera and recorder units.

SUMMARY OF THE INVENTION

This invention relates to a portable recording unit containing a television camera, a television signal recorder, a television monitor and manual controls for selectively operating such devices to effect electro-optical scanning of an image field, recording of the image information and monitoring the recorded information. The unit is operable either in a single frame recording mode or a multiple frame or motion picture recording mode whereby either or both types of recording may be effected per se or sequentially with respect to a magnetic recording member, such as a magnetic tape, provided as a recording medium for a recording and playback unit supported within the single housing of the device.

Heretofore, it was known in the art to provide a manually operated portable television camera in one housing, a television tape recorder in another housing located remote from the camera and a battery located in a third housing wherein all three units are interconnected by means of flexible wires. Such an arrangement of components and their connections are quite difficult to handle and operate and are subject to operational breakdown for a number of reasons including the fact that the interconnecting wires may be tensioned during use resulting in disconnections of the couplings between components which may occur when the lines are tensioned.

The instant invention not only provides a unitary portable unit containing a television camera in a single housing, but the unit is so arranged and constructed that the single housing also contains a magnetic tape or card recorder for television signals, a monitor device for viewing the recorded information or the output of the television camera, a battery which may be easily charged while in the housing, and suitable manual controls for properly operating the camera, the recorder and the monitor.

Accordingly it is a primary object of this invention to provide a new and improved television camera-recorder and methods for operating same to record motion and still picture phenomena.

Another object is to provide a television camera-recorder which is portable and hand holdable during its operation and which is defined by a single housing to simplify its handling and operation.

Another object is to provide a television camera-recorder capable of recording both motion picture and still image video signals on an erasable record member and selectively generating hard copy as photographs of select still image signal recordings without resort to an external hard copy device.

Another object is to provides a television camera-recorder with an electronic display, such as a cathode ray tube, forming part of a unitary assembly and viewable by an operator of the camera to permit such operator to view the picture information output by the camera or from the recorder as the camera is hand directed and operated.

Another object is to provide a television camera-recorder unit with an electronic display with manually operable means for causing such display to selectively display still picture information which is either output directly from the camera or from the recorder of the unit wherein such unit includes hard copy producing means for providing prints of select images generated on the display.

Another object is to provide a television camera-recorder with an electronic display which is viewable to a person operating the camera and a projection system for projecting still or motion pictures displayed by the display.

Another object is to provide a television camera-recorder in a unitary assembly with a projection optical system for the video signal information output by the television camera.

Another object is to provide a control system for a magnetic recorder employing a single switching device for recording either still image or motion picture image information on a single magnetic recording member in accordance with the manner in which the switching device is actuated.

Another object is to provide a method of operating a magnetic tape recorder to permit it to record either still or motion picture information.

With the above and such other objects in view as may hereinafter more fully appear, the invention consists of the novel constructions, combinations and arrangements of parts, as will be more fully described and illustrated in the accompanying drawings, but it is to be understood that changes, variations and modifications may be resorted to which fall within the scope of the invention as claimed.

In the drawings:

FIG. **1** is a side view with a side wall removed of a portable, hand held television camera, recorder and monitor device;

FIG. **2** is a top view of the device of FIG. **1**;

FIG. **3** is a side view with parts broken away for clarity of a modified form of the device of FIGS. **1** and **2**;

FIG. **4** is a side view of the device of FIG. **1** having certain modifications thereto;

FIG. **5** is a schematic diagram showing components of the camera device of FIGS. **1** and **4** for electrically controlling the operation thereof in a plurality of different modes of operation.

In FIGS. **1** to **4** is shown a portable television camera and recording unit **10** having its major components supported

within a single box-shaped housing **11** formed with rigid top and bottom walls **12** and **13**, side walls **14** and **15**, a front end wall **16** and a rear end wall **17**.

Supported at the front end of the housing **11** on a shelf **37** extending between the side walls thereof a distance above the bottom wall **13** is a miniature television camera **32** which may be operated to generate monochrome or color television signals on its output. Supported below the camera **32** is a rechargeable battery **22** having terminals **23** for receiving rechargeable electrical energy from the exterior of the housing and connected by wires (not shown) through suitable switches, to be described, to the energizing input of the camera **32** and the other electronic units supported within the housing **11**. Supported directly behind the camera **32** is a television recorder **24**, such as a television tape recorder having an elongated opening **24**A in its side wall for receiving a cartridge or cassette of magnetic tape. The recorder **24** may be a scaled down version of a conventional so called video cassette recorder containing suitable motor driven mechanisms for either recording directly on magnetic tape while it is supported within the cartridge which is inserted into the opening **24**A or on such magnetic tape while a portion thereof is removed and wound around a rotating drum containing one or more magnetic recording and reproduction transducers operable to helically scan transverse tracks of the tape as the tape is driven past the drum. Such mechanisms as provided in video cassette recorders such as the so called Betamax produced by the Sony Corporation of Tokyo, Japan, or similar types of video cassette recorders produced, for example, by Sanyo Company, Matsushita Electric Company, and JVC (Japan Victor Corporation) all of Japan, may be employed in the video recorder **24**.

Supported behind the recording unit **24** and having a viewing screen **27** is a miniature television monitor **26** which is operatively connected by wires (not shown) and suitable switches, to be described, to both the outputs of the television camera **32** and the recorder **24**. Extending forwardly of the housing **11** and optically coupled to the television camera **32** is a suitable camera lens housing **28** containing the necessary lens or lenses for directing light to the electro-optical input of the camera **32**.

The housing **11** contains two handles, a rear handle **19** defining a pistol grip and having pivotally mounted near the upper end thereof a trigger actuator **20** which may be finger pivoted in the counter-clockwise direction toward the handle **19** to manually close two sets of contacts, one of which sets defines an over eye switch which is operated when the actuator **20** is lightly depressed for controlling the recording of a single frame of television picture information, while the other is operated when the actuator **20** is totally depressed and is employed to effect motion picture scanning and recording as will be described. A second handle **21** is provided near the front end of the housing **11** to permit the housing to be supported by means of both hands and to provide suitable support therefor so as to permit the trigger actuator **20** and other switches to be described to be operated by the fingers of the hand gripping the pistol grip handle **19**. Notation **19**A refers to the bottom portion of the handle **19** which may include an electrical coupling device for connecting an external source of electrical energy to the camera in the event that the battery **22** is discharged or is not employed.

Also shown in FIGS. **1** and **2** is an optical system for optically scanning the image information entering the housing **28**. Certain details of such optical system are shown in FIG. **3** and include an optical prism **31** which is so arranged as to pass a portion of the entering light upwardly through an opening **30** in a tubular receptacle at the end of the housing **28** and then through a second opening **30** to a second prism **35** which directs the image light pattern along the elongated tubular housing defining unit **38** to a viewing eye piece **38**A at the rear end thereof. A portion of the light passed to prism **31** enters the camera **32** where it modulates suitable camera electronics including a read beam containing cathode ray tube or other suitable television scanning means.

In the embodiment illustrated in FIG. **4**, the side wall of the housing **11** is in place and is made up of a number of separately removable or pivotable components including a first hinged section **15**A which may be pivoted upwardly or removed to permit access to the rechargeable battery **22** for replacement or inspection thereof. A female receptacle **36** is mounted on the wall section **15**A for receiving a plug extending from a suitable battery charging unit for charging the battery.

A wall section **15**B is removably mounted on the housing and contains a panel **33** supporting a plurality of controls for adjustably controlling the television camera **32** to vary such functions as brightness, vertical stability, color circuitry, etc.

A third section **15**C of the side wall contains an elongated opening **15**D therein permitting a magnetic tape cassette or cartridge to be inserted into the housing **11** and passed into the magnetic tape or reproduction unit **24** through the opening **24**A aligned with **15**D. A plurality of switches **51** are supported on the side wall of the panel **15**C and are employed to control recording and reproduction operations as will be described.

A fourth panel **15**E, also removable from the housing **11**, forms part of its side wall and covers the monitor unit **26** which may be removed from the housing when the panel **15**E is removed. Switches supported by the panel **15**E may be easily operated to control the operation of monitor **26** supported immediately behind panel section **15**E.

Also illustrated in FIG. **4** is a second trigger actuator **39** supported by the front handle **21** which may be employed to operate one of the control switches described hereafter. For example, when actuator **39** is manually squeezed or pivoted, it may be employed to close a switch for effecting the recording of a single frame television picture signal on the magnetic recording member of the recording unit **24**. Actuator **20**, when depressed, may be employed solely to close a switch for effecting motion picture signal recording on the recording member of the recorder-reproduction unit **24**. Either actuator may also be employed to provide for instant playback of recorded information, when manually depressed.

It is noted that the recorder and reproduction unit **24** may also comprise a magnetic card recorder-reproducer device of the types defined in U.S. Pat. Nos. 3,943,563; 3,803,350; or 3,818,500 or of the type manufactured by the Sony Corporation of Tokyo, Japan under the trade name Mavica as described in the November/December 1975 issue of Video Systems Magazine. If such a magnetic card recorder/reproducer unit is employed in the location shown in FIG. **1**, the openings **24**A and **15**D in the side wall of the housing **11** would be narrow enough to accomodate and guide a suitable magnetic card inserted therein by hand into the recorder housing wherein it may be power driven by suitable rollers to an operative location for video signal recording and/or reproduction scanning as described. Such movement into the recorder housing may be effected automatically when a sensor senses the leading edge of the magnetic card and

controls a drive motor, or in response to the operation of a manual control switch located on the side wall of the housing **11**. Single and/or motion picture frames of full frame video picture signals may be recorded with locating codes on the face if the magnetic card containing the magnetic recording material.

Also shown in FIG. **1** is a microphone **87** supported at the front end of the housing **11** adjacent the battery **22**. The microphone **87** may also be supported on an extendable or folding arm on the outside of the housing for picking up sounds to be recorded along with video motion picture recordings as will be described. A loud speaker **125** is shown supported by the video recorder **24** facing one side of housing **11** and openings **15**F are provided in the side wall portion **15**C to permit sound from the microphone to be heard exterior of the housing **11**.

ELECTRONIC CONTROL SYSTEM

In FIG. **5**, the control system for the camera recording unit **10** includes a normally open manual switching means **31** which is operated, per se or, when the trigger **20** is manually depressed which gating from the battery or power supply **22** which may comprise a rechargeable battery as described, to all active circuits in the system **30** for all modes of operation which will be described. The television tape recording and playback unit **24** may be of the helical tape scanning type employing such constructional details as provided in such U.S. Pat. Nos. as 2,998,495; 3,404,241; 3,397,783; 3,051,777; and 3,803,350.

The magnetic tape or card recording unit **24** receives the television signal or signals generated on the output of camera **32** which signals are converted to frequency modulated signals which are applied to one or more magnetic recording heads denoted by the general notation **56** supported by a rotating drum **55** wherein the rotating heads scan, in a so called helical scanning operation, transverse tracks of a magnetic tape supported within and supplied by a cartridge or cassette inserted into the opening **15**D in the side wall of the housing of the portable unit **10**. One or more stationary magnetic heads **89** are also provided for recording audio information received from a microphone **87**, along one or more audio tracks and one or more stationary pulse or code recording heads **61** are provided to record coding information along a code track or tracks of the magnetic tape or card.

The trigger actuator **20** located adjacent the handle **19** is mechanically connected to a normally open multiple-pole switch **43** which is provided with two switching positions or contact pairs one of which, denoted **43**A, is operable to effect control of the television camera **32** in a manner to cause it to full-frame sweep its image field one complete cycle while attainment of the second switching position or contact closure as defined by section **43**B of the switch **43** results in operation of the television camera **32** in a continuous manner to continuously generate and output television picture signals as long as the contacts of switch section **43**B are closed.

When the trigger actuator **20** is slightly depressed, the contacts of switch section **43**A are closed while the contacts of section **43**B remain open. When trigger actuator **20** is firmly depressed, the contacts of switch section **43**A are closed which activates a switch debounce circuit **44** energizing an OR gate **45** and a second OR gate **46**. OR gate **45** activates a transmission gate **47** passing motor drive signals from a reference generator **48**, which is synchronously locked to an oscillator **49** having a crystal feedback means **50** for stability and accuracy, through a single pole double throw switch **51**A forming part of a multiple-switch assembly **51** which is employed to effect either a playback or recording operation, said motor drive signals being thereby gated to a motor drive circuit **52** controlling a synchronous motor **53** which drives the tape capstan wheel **54** advancing and driving the magnetic recording tape T past a record playback head assembly **54**. The record playback head assembly **54** contains several magnetic record-playback heads denoted **56**A, **56**B, **56**C, **56**D, or a single head depending on the manner in which the magnetic recorder is designed and the head or heads are supported by a drum which rotates on a shaft **58** driven by a high speed motor **57** which is synchronized to the output of the reference generator **48** through motor drive circuits **59**.

The output of reference generator **49** is also connected to circuitry **60** defining control track recording electronics which controls the motor **57** and the recording of the output signals of the reference signal generator **48** on a control signal recording track of the tape so as to be available, when reproduced therefrom to effect playback synchronization.

The visual or image information signals to be recorded on the tape are derived by the electro-optical scanning means of the television camera **32** as received through the camera lens **28** and are generated as full-frame video picture signals on the output **32**A of the camera which signals are intensity modulated in accordance with the brightness features of the image field which is electronically scanned by the read-beam or other scanning means of the camera. The horizontal and vertical synchronization signals which are utilized to control the sweep of the read-beam or flying spot scanner of the camera **32** are applied to the read-beam control input **64**, are derived from a sync signal generator **65** and are synchronized to the rotational movement of the magnetic head assembly by means of signals generated by a rotational position sensor **66** which may comprise a photoelectric, electro-mechanical or other form of sensor sensing the rotation of the shaft **58** of the motor **57** driving the drum **55** containing the magnetic transducting head or heads **56**. The sensing signals so generated are amplified in an amplifier **67**. The full-frame video picture signals generated on the output of the television camera are passed to an analog-to-digital converter **68** through the contacts **51**B of the single hole double throw switch **51** described and the output of the converter **68** is presented as a digital code representing the brightness and color value associated with the video signal output of the camera which code signals are passed to the write-inputs **69** of a full-frame memory device **70**. The sweep signals generated by sweep signal generator **65** are input to an analog-to-digital converter **71**, the output digital signals of which are passed to an address pointer **72**, the outputs **73** of which are applied to selectively activate the proper locations of the memory **70** for recording the brightness levels of the digitized video picture signal elements presented on the outputs **69** of the analog-to-digital converter **68** when a write-enable input **74** for the memory **70** is activated.

The memory **70** is continuously swept by the address pointer **72** in synchronization with the movement of the head assembly **55**. The signals generated on the read-outputs **75** of the memory **70** thus continuously represent the information content of the memory **70**. The output signals are passed to a digital-to-analog converter **76** on the outputs **75** and the output of the converter is generated as analog video signals which are passed to the input **78** of a video monitor **79** such as a cathode ray tube or other form of electronic display for displaying the information recorded in the memory.

The write-enable input **74** of the memory **70** is activated by the output of an OR gate **46** when the contacts of switch section **43**B are closed as described.

OR gate **46** also activates a transmission gate **81** when a manually operated single pole double throw switch **82**A is closed, passing the video signal generated on the output of the digital-to-analog converter **76** to an F.M. modulator **83** which conditions the video signal for recording by combining it with the sync signal generated on the output of amplifier **67** which is passed to the input **84** of the modulator **83**. A manually operable double throw switch **51**C is employed to connect the recording heads **56** to the output of the modulator **83** while the output of the amplifier **67** is connected to an input **86** of an electronic switch **85** which is operable to connect the appropriate head **56** of the bank of heads **56**A–**56**D in timed synchronization to the output of the F.M. modulator **83** and the amplifier **67** to effect the proper recording of the video picture signals on respective transverse tracks of the tape as it is driven around the rotating head assembly.

An audio signal of sounds generated in the vicinity of the camera may be recorded in the conventional manner by gating the output of a microphone **87** to a proper recording electronic circuit **88** through a manually operated single pole double throw switch **51**D which is connected to an audio record-playback head **89** which is stationarily supported in the recorder to record along an audio track extending parallel to the longitudinal axis of the magnetic tape. The operations described above essentially define recording and playback for the motion picture mode of recording operation of the apparatus **10**.

SINGLE FRAME RECORDING

In order to effect single full-frame video picture signal recording of information derived from the television camera the following operational functions are noted. The finger operated trigger actuator **20** for the manually operated switch **43** is slightly depressed which activates the normally open switching section **43**A thereof activating a switch debouncing circuit **90** which causes a pulse generator **91**, such as a monostable multi-vibrator, to set the latch **92** of the switch as a result of generating a very short pulse each time switch **43**A is so activated. The output of the latch **92** is applied to an input of OR gate **45** resulting in the subsequent controlled operation of the tape drive motor **53** which drives the tape capstan **54** and any other mechanism necessary to effect tape drive movement against or around the head drum as previously described.

The output **92**A of the latch **92** becomes energized and the signal so generated is passed to activate a code generator **94** after being delayed by means of a time delay circuit **93** for a sufficient time interval to permit the tape drive motor **53** to start up and attain operating speed. The code generator **94** generates a unique code which is determined either by the manual operation of a bank of coded switches **95**, for example by employing thumb wheel BCD switches, such activation occurring when a single pole double throw manual switch **96** is in its manual operational position as shown or when said switch **96** is in its automatic operational position and is connecting a counter circuit **97**, which accumulates one count each time the clock is pulsed by AND gate **98** to said code generator **94**. The output of the AND gate **98** is activated every time a signal is present on both its inputs, one of which inputs is connected to receive the sync signal generated on the output of amplifier **67** for the motion picture mode of operation and the other to the output of the OR gate **45** which is activated when it is desired to effect video signal recording in either the motion picture or single frame recording modes. The counter **97**, which accumulates one count for each frame actually recorded, may be reset by means of a reset switch **99**, which may be manually operated and/or automatically operated as a limit switch when engaged by a portion of the housing of the magnetic tape cassette or magnetic card inserted into the housing of the recorder-playback unit.

The output of counter **97** is connectable in addition to the code setting input of the code generator **94**, to a decoder-driver circuit **100** through switch **96** to provide a display of the count on a display means **101**, such as a light emitting diode, liquid crystal diode, or other form of digital display which is connected to the decoder-driver circuit **100** and which provides a visual indication of the frame number being recorded. The output of the code generator **94** is a digital code signal which is in a form to be immediately recorded by head **61** on the control track of the magnetic tape or card along with the synchronization control signals as described, without interference to the operations effected by means of said controls signals.

Time delay circuit **93** also is employed to activate a further time delay circuit **102** providing a time delay which is sufficient for the recording of the code generated just prior to the generation of the full-frame video picture signal which is associated with said code. The time delay circuit **102** has an output which extends to one input of an AND gate **103**. The other input to AND gate **103** extends from the output of sync signal amplifier **67**. When both inputs to gate **103** are energized, a signal is generated on the output of the gate which sets a latch **104** which, in turn, activates an input of OR gate **46** energizing the enabling circuit **74** for the memory **70** during operation of the unit in the motion picture mode. The latch **104** is also employed to activate a time delay circuit **105** having a delay which is slightly longer than the duration of the sync pulse derived from the amplifier **67**. Delay circuit **105** is connected to one input of an AND gate **106**. The other input to AND gate **106** is derived from the output of sync amplifier **67**. When the AND gate **106** becomes energized, it passes a signal on its output which is generated after the first sync pulse indicating the beginning of the next recorded frame and thereafter generates a second sync pulse indicating the end of the recording frame, which second signal serves as a reset signal to reset both latches **92** and **104** thereby conditioning the system to properly effect the recording of the next frame and deactivating the OR gate **46** and the enabling input **74** to the memory so as to hold the frame information just generated within the memory **70** until the next frame is presented thereto or, in the single frame recording monitoring mode, until the energizing power to the memory is removed or deactivated.

Provision is also made in the control system illustrated in FIG. **5** to permit the video information generated by the television camera to be previewed on the viewing screen of the monitor before recording such information in the magnetic recorder **24**. To effect such previewing, manual switch **82**A is operated in a manner to inactivate transmission gate **81** and to prevent the transfer of video picture signals from the digital-to-analog converter **76** to the F.M. modulator **83**. Switch **82**B, which is mechanically coupled or connected to switch **82**A, is also operated to a preview position, disenabling the OR circuit **45** and thereby terminating the passage of motor drive signals to the tape drive motor **53** and preventing the movement of the tape past the heads during the preview operation. If it decided that the visual information presented to the viewing screen of the monitor **79**,

which is held in memory **70**, is to be recorded, a record switch **107**, such as a momentary contact normally open switch, is manually depressed which activates a pulse generator **108** which sets a latch **109** which activates one input of an AND gate **110**. The AND gate **110** generates a control signal on its output when both its inputs are activated, the other of said inputs extending from the recording amplifier **67**. The output of the AND gate **110** is a clock pulse which is passed to an OR gate **111** which is connected to a flip-flop switch **112**, the $\overline{Q}$ output of which subsequently becomes activated allowing the tape drive motor **53** to be operated when the OR gate **45** is also activated. The $\overline{Q}$ output of the flip-flop **112** also activates a time delay circuit **82**D which, after suitable time delay sufficient to allow the motor **53** to attain running speed from starting and the recording of the frame code as described, activates transmission gate **81** passing the video signals to be recorded therethrough to the recording heads. When the $\overline{Q}$ output is activated, the Q output of the flip-flop switch **112** is inactivated. When the next sync pulse, during the single frame mode of recording, is received from the amplifier **67**, the flip-flop switch **112** switches causing the $\overline{Q}$ output to become inactive and preventing the passage of video signals to the modulator **84** and the motor drive signals to the tape motor **53**. The $\overline{Q}$ output is then reactivated creating a pulse on the output of a pulse generator **113** which is applied to reset the latch **109** readying it for the next recording cycle. In the motion picture mode, the preview operation may be attained in a manner similar to that in which the preview operation was effected for previewing the single frame output of the video camera with the exception that the AND gate **114** is deactivated by the debounce circuit **44** and the $\overline{Q}$ output of flip-flop switch **112** activates the OR gate **11** preventing a change of state of the input to the flip-flop switch **112** during the changing output of the AND gate **110** until the manual switch **43**B is released and inactivates the debounce circuit **44** and also the AND gate **114** so as to allow passage of the next clock pulse from the AND gate **110** through the OR gate **111** to the clock input of the flip-flop **112** when the described toggling and reset functions are effected.

MOTION PICTURE PLAYBACK MODE

The motion picture playback mode may be effected when the switch **51** containing the contact pairs denoted **51**A, **51**B, **51**C and **51**D is in the motion picture playback position and the normally open momentary contact switch **115** is actuated without a code being set up in the coded switches **95**. The switch **115**, when so operated, activates a pulse generator **116** which sets a latch **117** activating OR gate **45** starting the tape drive motor **53** as described. The tape then travels past the record-playback head assembly **54** in a manner to permit the playback head or heads **56** to scan and pick up the recorded signals and to transfer them through the electronic head switching means **85**, operating in reverse to the described recording mode, and switch closed **51**C to the F.M. demodulator **118**, the output of which is a composite video picture signal representative of the composite video picture signal recording so reproduced, which composite signal is fed to a sync separator **119** which serves to separate the sync signals from the composite video signal and present same on an output **120** while the video picture signal elements separated from the reproduced composite video picture signal are passed on a second output **121**.

The sync signals generated on the output **120** are passed to the reference generator **48** through switch **51**A and define the means whereby synchronization is effected between the movement of the tape and the rotation of the head assembly **54** to insure proper head position with respect to the transverse recording tracks of the tape. The video picture signals generated on the output **121** are transmitted to the analog-to-digital converter **68** and are converted to digital codes representing the brightness and color levels of the picture elements making up the frames of the video information. The write-enabling means is thus continually activated in the motion picture playback mode by the proper operation of a bistable switch **122** through OR gate **46**. The operation of the memory **70** and its associated circuitry for controlling the monitor **79** is effected, as described, under the recording mode of operation wherein the output **121** of the sync separator **119** is substituted for the picture signal output of the television camera. In this mode of operation, a control track reproduction head **61** reproduces the recorded signals from the control track of the tape and passes same through a switch **51**E to playback amplifier electronic circuitry **123** of conventional design and to the reference signal generator for subsequent application to the tape drive motor **53**, as previously described, to maintain the operation of said motor in synchronization with the recordings provided on the tape.

The audio signals generated by the playback circuit of the audio reproduction head **89** in scanning the recordings of the audio track of the magnetic recording member of the recording unit **24** are passed through switch **51**D to conventional playback-amplifying electronic circuits **124** to which is connected a speaker **125** supported by the housing **11** of the portable unit **10** to accompany the motion picture video information reproduced from the magnetic recorder and displayed on the monitor.

SELECTIVE SINGLE FRAME PLAYBACK

In order to effect the reproduction of selected full-frame video picture signals from the recording unit **24**, a selection code is generated by the selective operation of the bank of code generating switches **95**, the output of which extends to a code comparator circuit **126**. Switch **115** is manually closed and when the frame location of the magnetic tape containing the selected frame is driven into alignment with the reproduction heads, a decoder **132** senses the code signals reproduced from the frame code recordings on the magnetic tape adjacent the selected frame after they are amplified by means of the control track playback electronic circuitry **123** and when the code so generated matches the code generated on the outputs of the bank of switches **95**, the output of the code comparator **126** becomes activated setting a latch **127** which effects energization of the write-enable input **74** to the memory **70**, as described, through OR gate **46**. The output of latch **127** extends to one input of an AND gate **128**, the other input of which extends from the output **120** of the sync separator **119** which is activated with the reproduced video information at the beginning of the reproduction of the recording of the selected full-frame video picture signal causing the AND gate **128** to transfer a clock pulse to the JK or flip-flop switch **129**, the output Q of which becomes inactive. Upon the subsequent generation of a sync pulse and its application to the AND gate **128** at the end of the reproduction of the selected frame, said AND gate creates a second clock pulse for the flip-flop switch **129** causing the Q output thereof to be reactivated, which causes a pulse generator **130** to generate and transmit a pulse to the reset input of latch **127**, thus deactivating said latch and its control devices (e.g., OR gate **46** and AND gate **128**).

Memory **70** and monitor **79** are operated as described for the motion picture mode and the monitor is thus energized to display the selected video picture signal information as a

still image on its display screen in accordance with the recording thereof in the memory **70**. The code comparator **126**, when activated, also operates to reset latch **117** a time delay thereafter as determined by the time delay element or circuit **131** having a delay interval which is sufficient to permit the playback of the entire selected full-frame video picture signal reproduced from the magnetic recorder and said time delay-element operates to deactivate the tape drive motor when the selected frame has been reproduced and applied as described. The image information contained in the selected full-frame video picture signal is thus displayed as a still image and may be retained for an extended period of time until another frame of image information is similarly reproduced and applied to the monitor or the motion picture mode of operation is selectively initiated or the power is turned off.

A number of alternative arrangements for the system provided in FIG. **5** are noted. For example, although a four-head magnetic tape recording and reproduction unit is illustrated in the drawings, any other video tape, video card or video disc recording means may be employed embodying suitable circuit and control changes therein as required to effect the described operations. Video picture signal synchronization signals may be derived by means other than that illustrated and described, such as by means of crystal oscillators, electro-mechanical means, microminiature pulse generating circuits, etc.

Other forms of monitoring devices, such as charge coupled devices, may be utilized to replace the cathode ray tube monitor **79** and should they contain digitizing circuits, it may be possible to eliminate the analog-to-digital and the digital-to-analog devices employed in the circuit diagram **80** as to simplify the electronic circuitry presented and described.

It is also noted that the memory **70**, which is provided herein as a RAM or read-write memory may also comprise any suitable type of memory such as a serial shift register, a charge coupled (CCD) device, a magnetic bubble memory, a rotating disc or drum or any other type of pulse signal storage device capable of storing at least a million bits of full color, high resolution, single frame picture information wherein the appropriate circuit modifications to operate such memory would be provided.

An alternative means for storing single frame video picture signals may comprise a solid state memory **133** which may be connected, as shown, by means of pluggable contacts denoted **136, 137 138** and **139**. For recording, such memory **133** is connected to receive the video signal at the output of transmission gate **81** by means of a plug contact **138**. A recording enabling signal may be generated and applied to the memory **133** from the control input to the transmission gate **81** through a contact **139**. Synchronization may be provided for the memory by means of the sync signals generated on the output of the amplifier **67** through plug contact **137**. Operation may be effected as described.

In order to effect playback of the single frame video picture signal in such a mode of operation, the memory is connected to the socket contacts **136–139**. Since the recording input contact **136** is not energized due to the deactivation of the transmission gate **81** no video picture signal will be present at the contact **138** Synchronization may be provided, as described, through contact and the video picture signal output of the memory is passed through contact **136** to the analog-to-digital converter **68**, through switch **51**B and is thereafter subsequently displayed as in the described reproduction playback mode. In such modes of operation, the memory may retain its information in storage even after the tape is disabled or removed from the unit. Such a memory may comprise a static programmable serial type of memory.

It is noted that the coded switches **95** may include or be replaced by an automatic code generator for generating a different code in a progression of codes to be recorded along with each still picture video signal recorded to permit the selective play-back of the video signal from the recorder at a future time as described for selectively viewing the still picture represented thereby.

If switch **51** is operated to gate the output of camera **32** to the AID converter **68**, the video signal information output by the camera may be simultaneously applied to the monitor **79** and the video recorder if switch **51**C is switched to the recording mode, thus permitting TV camera operation to be monitored as the camera is operated and its output is recorded.

Modified forms of the apparatus of FIGS. **1–5** are noted as follows:

I. If it is desired to transmit the outputs of either or both the television camera **32** and video recorder/reproduction unit **24** to a remote receiver such as a video monitor, a short wave transmitter may be provided in housing **11** and connectable, through suitable manually operate bistable switching means, to either the output of the video recorder **24** or the camera **32** to transmit via short wave to said remote receiver whichever signals are generated, by the camera or recorder (e.g. —single full frame video picture signals or motion picture video picture signals). Such signals may be generated as described by the operator of the unit **10** actuating the described switches or, in another mode of operation, generated under remote control by employing a short wave receiver in the housing **11**, the output of which is connected to coded relays or logic circuits responsive to respective control codes transmitted thereto from a short wave transmitter at the monitor and generated when the operator thereof selectively closes code generating switches. Transmission of said video signals may also be effected by means of closed circuit television means employing a flexible cable connected to the outputs of the television recorder **24** and camera **32**, preferably by being coupled to a connector at the bottom of the handle **19** as described. Remote control of both the camera and recorder **24** as set forth in FIG. **5** may also be effected by direct remote wire connection through said cable to the various control devices described.

II. A magnetic tape, card , disc, or solid state or bubble memory recording unit may supplement or replace the unit **24** in the housing **11** and may also be connected as illustrated in FIG. **5** by means of wires extending through a flexible cable to the camera, monitor, battery, microphone, speaker and control switches supported by or within the housing **11**. Such recording-reproduction unit may be contained, for example, in a harness or strap held retainer which is held on the belt or shoulders of the operator of the camera and may be operated as described by means of the control switches supported by the housing **11** and/or by means of similar control switches supported by the housing for the recorder and reproduction unit.

III. In yet another embodiment, it is noted that the recorder and reproduction unit **24** supported within the housing **11** may be operable to receive and record single frame and/or motion picture television signals from a remote camera by employing either a short wave receiver for such signals within housing **11** and having its output connected to suitable code responsive controls for the recorder **24** or

direct wire connection via cable connected to the handle **19** to said controls.

IV. If the recorder and reproduction unit **24** is a magnetic card reader-reproducer or for magnetic disc recorder-reproducer, suitable receiving means for magnetic cards or discs may be employed wherein such record members are inserted into slotted openings in the top wall **12** or either of the side walls of the housing to bring them into operable engagement with mechanisms for conditioning the for recording and reproduction operations as described. Storage space for such cards or discs may be provided in the housing adjacent the battery or recorder **24**.

Added to the circuits of FIG. **5** either in parallel with the coded switches **95** or as a replacement therefore may be an automatic code signal generator for generating a progressive binary code each time a single full frame video picture signal is generated by camera **32** and recorded so as to provide a different code recording with each full frame video picture signal recording to permit the selective reproduction of full frame video signals as described.

VI. It is also noted that the camera **32** employed in the hand held unit **10** of FIGS. **1–3** or in a system employing such camera and a separate videocassette recorder connected thereto for recording the output of the camera, may also contain an image converter tube or other form of image converter for convert-video picture signals generated in scanning phenomena at a low light intensity to signals which may be applied in the manner described, to both the visual monitor screen and the recorder unit which signals have been so modified by the image converter that the images generated therefrom may be easily monitored and discerned or studied. Such image conversion means may be employed to provide suitable images during either the single frame recording and monitoring or the motion picture mode of operation of the recorder and monitoring subsystems.

VII. Various videocassette recording and reproduction mechanisms and supporting circuitry as described may he employed in the portable camera, recording and playback unit **10** of FIGS. **1–4**. Magnetic recording and playback apparatus found in such videocassette recorder-player units as the Betamax SL-3000 and other videocassette recording units made by Sony Corporation of Tokyo, Japan; the 2200 VCR, the VR 1000PW and other videocassette recording units manufactured by Matsushita Electroc Co., Ltd. of Tokyo, Japan; the VP-7300 manufactured by Akai of Japan contain magnetic tape recording and reproduction transducing means and cassette take handling means which may be employed in a unit of the type shown in FIGS. **1–4** and/or modifications thereof.

It should be understood with respect to the circuit diagrams defined in FIG. **5** of the drawings and described above that suitable power supplies having correct polarities and connected to be energized by the described rechargeable battery or a source of line current are provided where not included in the drawings so as to supply proper electrical energy for appropriately operating the various illustrated circuits as described in the specification.

VIII. Photographic or other form of hard copy printing means may be provided within the housing **11** or in a housing which is coupleable thereto for making hard copy or photographic prints of images received either directly from the optical system in the housing **28** or from or from image phenomena and light patterns generated on the video display screen **27** of the television monitor **26**. For example, an instant photographic unit, such as a Polaroid Land Camera unit may be provided in the bottom or rear of the housing for the recorder unit **24** , below or therebehind or above the housing **11** either as a permanent installation or removably connectable thereto or may be so disposed adjacent a side wall **14** thereof and modified such that its input lens will receive direct or reflected light from the display screen **27**, located as shown or facing one of the side walls **14** and **15**, or light passed to the optical system in the lens housing **28**. In the latter arrangement, suitable prisms , mirrors and lenses may be employed to direct such received light to the input of such photographic camera as may such optical components be used to also direct light from the image screen of the television monitor **26** to such instant photographic camera, modified instant photographic camera may also be removably attached to or built into the front end of housing **11** for receiving and photographically recording picture phenomena directly from the optical system in housing **28**. Its position may be one of those defined by notations **22** and **32** in FIG. **1**

FIG. **5** also shows such an instant photographic camera **80** which may be attached to or supported within housing **11**, such as in the subhousings or compartments containing battery **22**, the videocassette recorder **24** or defined in part by the side wall **15**A. Mechanical or electro-mechanical controls, such as push button or membrane switches, denoted **80**C are provided on the side wall of housing **11** or instant photographic camera **80** for manually adjusting camera variables such as aperture speed and opening, one of which push button controls is operable to trigger the shutter of the camera to open and properly close thereafter to take a picture of the image presented to the camera and, if utilized, to close a switch connecting an image intensifying device such as a suitable light source to be described, to a battery such as battery **22** or an auxiliary battery (not shown). Such instant camera operating and adjusting switches **80**C are also shown in FIGS. **1** and **4**.

In a modified form of FIG. **5**, the video monitor which the camera operator views while taking still or motion pictures or playing back same from tape recordings thereof, may be supported within housing **11** and operable to pass light of still or stop-frame images displayed on its screen, simultaneously or sequentially, to either or both eyepiece **38**A, through housing **38**, and/or to an optical system forming part of a camera assembly BOA which extends across and includes the aperture of the instant camera **80**. The video monitor **79** in FIG. **5** is shown as an assembly which includes a video viewing and image generating screen **79**S forming part of a device, such as a cathode ray tube (CRT) or a solid state array of charge coupled diodes (CCDs) or the like, in sufficient density to provide a high resolution electronic image of the field scanned by the video camera **10** as such scanning occurs or from signals of recordings derived from the videotape of the video recorder **24** as described. If the image displayed is a still image which is generated on the screen **79**S, it may be employed per se or after its intensification as input light to the instant camera for making a photographic hard copy thereof.

Light from the image field light pattern generated on screen **79**S of video viewing device **79**V may be passed directly to the input **80**A of the instant camera **80** to generate a photograph thereof when the instant camera is operated thereafter by the camera operator by depressing the proper switch of switches **80**S. Such light from screen **79**S may also be directly viewed per se by the camera operator without making a print thereof. In FIG. **5**, light from screen **79**S is reflected from a mirror or prism **80**P and other mirrors or prisms through housing **33** to the eyepiece **38**A. If device **80**P is a mirror, it may be normally spring biased to reflect

light to the eyepiece **38**A and eye of the photographer and pivoted or otherwise moved out of the way to allow light to pass directly from the screen **79**S directly to the lens and shutter assembly **80**A or other optically device(s) associated with the instant camera **80** to permit instant photographs to be taken, by manually or motor driving the shutter assembly to open. Thus one of the controls **80**C operating the instant camera may mechanically and/or electrically operate both the mirror pivoting and the shutter mechanisms simultaneously or sequentially to permit select pictures to be taken of the images displayed on screen **79**S of video display **79**.

The instant camera **80** may store and/or immediately deliver each photograph taken, from an end of the camera by the conventional motor driven means of Polaroid type instant cameras or modified forms thereof. If a modified form of such a camera is employed, it may be secured to the bottom wall of housing **11** of the embodiments of FIGS. **1** and **4**, as a replacement or support for one of the pistol grips **19** and **21**.

Also shown in FIG.**5** is a light source **80**L such as a high intensity lamp or lamps or a solid state laser which is energized by an automatic control means, such as a timer or microprocessor, connecting same to a source of suitable electrical energy such as battery **22** or an auxiliary battery (not shown) causing the light thereof to flood and/or scan the screen **79**S to provide suitable reflected light to the optical input means of the instant camera **80** for exposing instant photographic sheet material to such light when the aperture opens. Such automatic control means controls the operation of the light source **80**L and its scanning means, if used, and the aperture of the camera **80** to permit suitable photographs to me taken of image phenomena displayed on the screen **79**S of the display tube or chip **79**V.

In a modified form of operation of the invention, electronic display **79**V may generate motion picture images output from videocassette recorder **24** when controllably operated in the playback mode, wherein the operator may suddenly stop-frame control the recorder during such playback to capture a select still image on the screen **79**S which may be selectively photographed or erased from the screen by the means described. The videocassette recorder may also be operated in a stepping mode wherein select still image recordings of full frame videopicture signals which are digitally recorded on the magnetic tape of the videocassette recorder, may be selectively reproduced therefrom and selectively displayed as still images on the display screen or on an auxiliary display screen such as a large screen television monitor or receiver which is connected, for example, by cable to receive single frame or motion picture signals output by the video recorder **24** during a controlled playback mode of operation. When a still image displayed on such large screen is selected by a person to be photographed, its corresponding image on screen **79**S may be photographed as described.

Hard copy producing means other than a Polaroid type instant camera, such as a xerographic unit, may also be provided in a housing located in the bottom of housing **11** or therebelow to receive image field defining light from the video image screen **79**S.

IX. By replacing the single mirror or prism **80**P shown in FIG. **5** with a movable mirror and optical projection system, the television camera-recorders described above may also be utilized as large screen motion and/or still picture projectors. If the lens assembly **28** contains projection lenses or may be replaced by hand, such as by turning or snap-assembling and removing same from the endwall of the camera housing **11**, with such a projection optical lens assembly, image intensified light from screen **79**S may be reflected and passed through such projection lens system in housing **28** or an auxiliary housing connected to the camera housing **11** to permit same to be projected and viewed as an enlarged image against a screen or wall a distance from the camera. One or more light sources or lasers **80**L nay be continuously or pulse operated and/or scanned across screen **79**V to provide suitable projection light of the displayed phenomena such as still and motion pictures to be projected. Such light modulated by the images generated on the display screen **79**S in its reflection therefrom, may be directed per se through such a projection optical system which is part of or replaces the camera lens assembly **28**, may be projected directly onto a wall, projection screen or other means or may be further intensified by directing same against an image intensifying tube or solid state intensifier input operable to provide a new display to a further light projection system operable to project same from the camera against a wall or projection screen.

X. Control of all or certain of the variables associated with the operation of the television camera and the video recorders of the portable television camera-recording apparatus described above may also be effected automatically in response to select words of speech spoken into the microphone **87** by the operator of the camera-recorder unit described. A speech signal recognition computer, such as the General Instruments Corporation microelectronic chip denoted SP-1000 or speech recognition electronic circuits manufactured by such companies as Threshold Technology Inc. of Delran, N.J.; Dialog Systems, Inc. of Belmont, Mass.: Scott Instruments, Inc. of Denton, Tex.; Texas Instruments Corp., Dallas, Tex. (using their TNC 0820), etc. may be employed and operatively connected to an analog-to-digital converter connected to the output of microphone **87** or an auxiliary microphone located near the rear end of the housing **11**, may be employed which the operator may speak select speech into as he operates the camera-recorder so as to control by means of such select speech such functions as camera focus and zoom, an on-off switch for the camera, an on-off switch for the video recorder, selection of playback or recording functions for the video recorder by operating a bistable switch or selected of a plurality of selection switches, selective playback of selected information such as selected frames of video recordings received by the recorder from the television camera, volume control during recording audio, volume control during playback of audio including the shutting off of audio playback, the control of a motor or motors operating a variable aperture for the camera to selectively and/or incrementally adjust the amount of light entering the camera and others of the controls and switches described above. Manually operable switches and controls for effecting such functions which are speech signal controlled are also preferably provided at the wall(s) of the housing **11** and easily accessible to the fingers of either or both hands of a person operating the camera-recorder. Such speech signal control means may also be employed to control the operation of a hard copy printer, such as an instant camera or xerographic copy making means in the housing to make hard copy of select images derived from the video recorder's memory or tape.

XI. In yet another form of the instant invention, the video cassette magnetic tape recorder units **24** employed in television camera assemblies **10** of FIGS. **1** and **4** , may be replaced with erasable laser recording units employing erasable electro-optical recording tapes , cards or discs in which the television picture signals output by the television camera

32 are applied to modulate and operate a scanning beam of a laser in a manner to effect motion picture and/or still picture recordings along one or more record tracks of the tape card or disc. Selective reading, beam scanning playback of the video electro-optical frame recordings so made may be effected by control means and methods described above for one or more of the purposes of directly viewing still and motion pictures on the viewing screen of the camera display 27 and or through the eyepiece 38A receiving light from the screen 79S of the internally mounted electronic image display unit 79.

If a record disc is employed for recording video picture signals and making same available for selective playback, direct and projection viewing as described, it may be supported within a magazine or flat housing which is inserted into and removed from the elongated openings 24A and 15D of FIGS. 1 and 4 or similar openings in the top or bottom walls of the housings 11, wherein the disc hub is available to be engaged by a motor or hand advanced drive shaft of a gear motor in the housing to properly rotate the disc in such magazine for recording and reproduction purposes when scanned with a suitable laser beam from a laser on a pivoted arm which is controllably driven across the disc as it rotates to scan concentric tracks of the disc or a spiral track thereof through an elongated narrow opening in the side wall of the magazine.

XII. In yet another form of the instant invention, the output of the recording amplifier 88 which amplifies audio signals generated by the microphone 87, may be connected through a manual switch controlled by the operator of the television camera-recorder unit 24 to a microelectronic speech signal processing and analyzing computer which is operable to recognize select words of speech received by the microphone and generate respective control signals which are applied, as they are generated, to control one or more of the switching and control functions described above. For example, (a) the television camera 32 may be connected to and disconnected from battery 22, (b) camera output switch 51 may be selectively operated as described by a motor, solenoid or other control means controlled by one or more control signals generated by such speech signal analyzing computer, (c) video recorder control switch 51C may also be selectively controlled by control signals generated by such a speech recognition computer supported within or on housing 11 to selectively record and/or reproduce video picture information signals, (d) the driving means for pivoting mirror 60P for selectively passing the image field light from video monitor screen 79S to the instant camera 80 or the eyepiece 38A, (e) the controls 80C for selectively operating the instant camera 80 may be selectively operated by signals generated by such computer when select speech spoken into the microphone 87 is recognized as may a means for controlling the source 80L of image intensifying or projection light, etc. Additionally, switches 51D and 51E may be similarly controlled by signals generated by such speech recognition computer when selected speech signals are generated and recognized thereby to further automatically control the operation of the camera-recorder in one or more of the manners described above.

I claim:

1. A portable video unit comprising:

(a) a hand-held, box-like housing supporting:

(i) a camera having an output for electrical video picture signals representative of image phenomena occurring outside said housing,

(ii) a video recorder and reproduction device electrically coupleable to the output of the camera and having an output for picture signals reproduced from a record member supported in said housing,

(iii) a video-signal display unit including a display screen viewable from the exterior of said housing, and

(iv) a printer electrically coupled to the video recorder and reproduction device;

(b) a manually operated selection switch having two positions, wherein, without operating any other switch, in the first position, the video-signal display unit is coupled to the output of said camera and in the second position, the video-signal display unit is coupled to the output of said video recorder and reproduction device; and

(c) a manually operated printing trigger that, when in a predetermined position, causes the printer to output a hard copy of the image displayed on the screen.

2. A unit in accordance with claim 1 further comprising a microphone supported by said housing, and wherein said video recorder and reproduction device is configured to store and to reproduce audio signals produced by said microphone on said record member.

3. A unit in accordance with claim 1 further comprising a battery supported in said housing.

4. A unit in accordance with claim 1 further comprising a digital memory supported in the housing and coupled and sized to store a single frame of video picture signals, and wherein the memory is coupled to the printer and the printing trigger, so that when the printing trigger is activated, video picture signals are first stored in the memory and then reproduced from the memory and applied to the printer.

5. A unit in accordance with claim 1 wherein:

(a) said record member comprises video recording tape;

(b) said housing further includes a receptacle sized to receive a cassette holding a quantity of said tape;

(c) said video recorder and reproduction device includes reproduction and recording heads; and

(d) said receptacle is positioned to dispose said tape against said heads when a cassette is inserted therein.

6. A unit in accordance with claim 1 wherein said display unit comprises a cathode ray tube.

7. A unit in accordance with claim 1 wherein said display unit comprises a charge coupled device.

8. A portable video unit comprising:

(a) a hand-held, box-like housing;

(b) a camera supported within said housing and having an input for image phenomena occurring outside said housing;

(c) a first switch that, when activated by a camera operator, causes said camera to generate video picture signals on an output thereof;

(d) a video recorder supported within said housing, having an input electrically coupled to said camera output, and having a reproduction device electrically coupled to an output of said recorder;

(e) a second switch that, when placed by the camera operator in a predetermined position, causes said video recorder to record on a record member single-frame video picture signals received from said camera output at the input of said video recorder;

(f) a video monitor supported within said housing, coupled to display video picture signals, and having a screen viewable from the exterior of said housing;

(g) a third switch coupled to allow the camera operator to switch the display on the video monitor between said

camera output and said recorder output without operating any other switch;

(h) a hard-copy printer supported by the housing; and

(i) a fourth human-operated switch coupled to cause the printer to print a single-frame image from the output selected by the third switch.

9. The apparatus of claim **8** further comprising:

(a) a microphone supported by said housing;

(b) an audio recorder and reproduction device configured to store and to reproduce audio signals produced by said microphone on said record member, which comprises a quantity of recording tape;

(c) a battery supported in said housing;

(d) a digital memory supported by said housing and coupled and sized to store a single frame of video picture signals and associated audio signals; and

(e) a receptacle in said housing, which is (i) sized to receive a cassette holding a quantity of said tape, and (ii) positioned to dispose said tape against reproduction and recording heads of said recorder and reproduction device when a cassette is inserted therein.

10. The apparatus of claim **8** wherein the hard-copy printer is detachably connected to the housing.

11. The apparatus of claim **8** wherein the fourth switch is voice-responsive.

12. A method for generating, recording, and printing image information comprising:

(a) hand holding and directing a portable television camera and recording unit defined by a housing that includes a television camera, a video recorder and playback unit, a video monitor having a display screen, and a printer;

(b) operating the television camera to scan an image field and to output video picture signals;

(c) applying said video picture signals to the monitor to display the image field;

(d) upon demand, recording said video picture signals on a recording member supported by the housing;

(e) toggling a control switch, without operating any other switch, to switch the signals applied to said video monitor from the video picture signals generated by the television camera to video picture signals reproduced from said recording member, to display on said video monitor a previously recorded image; and

(f) selectively printing a single frame of said video picture signals, comprising either said camera-outputted signals or said reproduced signals.

13. A method in accordance with claim **12** including as part of (f) first storing said frame of video picture signals in a digital memory in said housing.

14. A method in accordance with claim **12** wherein (d) comprises inserting a magnetic tape cassette in a receptacle of the housing and recording individual frame of video picture signals on the tape.

15. A method in accordance with claim **14** further comprising storing said frame along with a code signal.

16. A method in accordance with claim **15** wherein (f) comprises employing said code signal to reproduce a selected frame of video recording from said magnetic tape.

17. A method in accordance with claim **12** including reproducing a selected single frame of recorded video information and applying it to said video monitor instead of video information generated by the television camera, to display on said video monitor a previously recorded still image, and wherein (f) comprises printing said selected still image.

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